Application is being made for second class mail rates.

Mathematics News Letter

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Published in the interest of the **Louisiana-Mississippi Section of the Mathematical Association of America** and the **Louisiana-Mississippi Chapter of the National Council of Teachers of Mathematics.**

A Challenge to Forward-looking Mathematics Teachers in the Colleges and High Schools of Louisiana and Mississippi.

Louisiana-Mississippi Section, Mathematical Association of America

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EXPANSION

The announcement of a regular subscription price in this issue of the NEWS LETTER is preliminary to our application for second class postal rates. Application for such rates is intended to be a step in economy. The cost in postage of sending out each issue heretofore published has been not less than $12.00, or one and one-half cents per news letter for 800 printed copies.

Consistent with the fixing of a subscription price is the effort to increase in quality and quantity the NEWS LETTER content. The aim of the officials of both the Section and the Council is the production and distribution ten times per year to the mathematics teachers—college and secondary—of Louisiana and Mississippi of a paper that shall have at least 50 cents of value for its readers.

OBJECTIVES

The following statement of purposes to be served is, we believe, sufficient argument for the program of expansion herein announced. It aims:

(1) To supply a bond of connection among the teachers and students of mathematics in Louisiana and Mississippi.

(2) To inspire those college and high school mathematics teachers who may be out of touch with the larger currents of mathematical development and of mathematics teaching to get in touch with them.

(3) To serve as a means of reenforcing and making effective in our own home territory all the expansion programs of the Mathematical Association of America and the National Council of Teachers of Mathematics.

(4) To promote a steady

growth in the membership of these organizations by endorsing or initiating plans to increase the number of readers of the *Mathematics Teacher* among the secondary teachers and the number of readers of the *American Mathematical Monthly* among college teachers of the two States.

(5) To constitute a news medium through which the programs and projects of every college or school mathematics department of the Louisiana-Mississippi territory can be made known to every other mathematics department of the territory.

(6) To promote the success of the annual joint meetings of the Louisiana-Mississippi Section of Mathematical Association of America, and the Louisiana-Mississippi Chapter of the National Council of Teachers of Mathematics.

(7) To support everything and everybody that supports mathematics.

OUR MAILING LIST

Through the courtesy of Superintendent Harris' office in Baton Rouge we have been able to make up a list of Louisiana high school mathematics teachers with their present addresses. Effort is being made to have a similar list compiled in Jackson for the State of Mississippi. In case the effort is unsuccessful Mr. W. C. Roaten of DeRidder, Mrs. Birdie Longmire of Alexandria, Miss Ida K. Smith of Meridian and Mrs. T. A. Summer, Jr., of Columbia, Mississippi, stand ready to assume the task of finding means of making up the Mississippi list. Indeed Mrs. Summer has agreed to make up the lists for ten of the southern counties of Mississippi and has already sent in the complete list for Marion county.

In addition to the mathematics teachers (college and high school) all college presidents and high school principals of the two States will receive the NEWS LETTER at least until the time when it is hoped that a sufficiently large number of paid up subscriptions shall have been sent in to make unnecessary its further free distribution.

Those wishing to become subscribers should send their subscription money to Secretary-Treasurer P. K. Smith, Station B, Hattiesburg, Mississippi.

MATHEMATICAL DISCIPLINE ?

What science in the hands of a wise teacher is so effective an instrument as is mathematics for building habits of scientific attitude and scientific method?

Independent of the application or the utility of the geometric theorem and the algebraic formula is the increase of mental power which is certainly acquired when

the following *habits* have been firmly fixed in the everyday practice of the student:

(*a*) The *habit* of noting, mentally, or in writing, all the facts of the data, or hypothesis of the problem to be solved, making use of analysis to do this, if necessary.

(*b*) The *habit* of being vigilant, to see that no fact of the data goes unused in the problem-solving process.

(*c*) The *habit* of holding definitely in mind the objective of the problem for the aid it may furnish in the solving process.

(*d*) The *habit* before undertaking the solution of a problem of determining the legitimate range of methods or principles to be used in its solution.

(*e*) The *habit* of checking a solution.

(*f*) The *habit* of euclideanizing the form of solution of an algebraic or non-geometric problem—as far as possible—when it promises difficulty.

(*g*) The *habit* of formulating all processes with precision, orderliness, and brevity.

Does such a bundle of habits constitute a *universal* discipline?

The New Curriculum in Mathematics

By W. D. REEVE,
Professor of Mathematics
Teachers' College, Columbia University

One of the most important topics of discussion at recent educational meetings has been the matter of curriculum construction. While the high school population has increased about 900% in the last thirty years, and the pupils who attend high schools today differ greatly in interests, experience, and inborn capacity to work with mathematics, we have not made progress appropriate to the needs of the pupils who have to study the subject.

If the right kind of curriculum is to be constructed in mathematics, there are certain definite things to be kept in mind. In the first place, we must make a systematic study of the objectives to be attained in the teaching of mathematics. No teacher can expect to obtain successful results who does not know definitely what he is trying to do. The second step is to determine the nature and the extent of the subject-matter which will best enable teachers to realize their objectives. The third step is to decide upon

the best methods of presenting the content material. The fourth step which has been sadly neglected in the past is to find how and under what conditions children learn most economically. The last step is to find out by means of a carefully selected testing program whether the desired objectives are being attained. The above procedure seems to be so evidently necessary that it is difficult to see why it has not been generally adopted long ago.

It is evident that no satisfactory list of objectives can be set up by consulting only existing courses of study from various places over the country. While they may be used as evidence of what is being taught throughout the country they do not often give much assistance in suggesting what ought to be taught. Moreover, it is well known that some of these courses, if not all, tend to perpetuate certain obsolete processes and antiquated business practices.

It is equally true that the best list of objectives cannot be secured by making an inventory of only the current text-books in mathematics. Many of these books are made by the authors only after a careful study of existing courses. They, too, are thus frequently guilty of overemphasizing unimportant or obsolete material.

The standard test makers of recent years have erred in including in their tests exercises and problems that thoughtful teachers everywhere have no desire to see perpetuated in our schools. In fact many of these undesirable elements were obtained by the makers of tests from existing courses of study and text-books. Some teachers, however, because of the undue attention to the recent testing movement have used standardized tests as though they were the course of study. It is obvious, therefore, that such tests cannot be used as the sole basis for determining a list of desirable objectives.

We also know that it is not safe to try to determine what mathematics ought to be taught by counting the frequency with which certain mathematical terms are used in a few current editions of newspapers and magazines. This is so evident to thoughtful workers that it is difficult to understand why some students of curricula should fall into the error of using the method.

We also believe that curriculum in mathematics for everybody should not be determined or restricted by extra mural examination boards. There is still plenty of evidence for believing that this is still true to a large extent in many places.

Finally, we cannot determine desirable objectives altogether by making a survey of certain towns, industries, and professions for the

purpose of finding out just how people use mathematics. The fact is that most people who really find mathematics useful cannot tell anyone how it is used. Moreover, many people have given little thought to the question as to how they might have used mathematics profitably if they had known more about it and had thought about it a little while.

Any and all of the above criteria may be of service to us in making out list of desirable objectives, but they will not suffice. If the objectives set up are to meet our modern needs, then we must have at least one other criteria that is supported by vision. The last criteria should be the opinion of experts in the teaching of mathematics,—people who are able not only to tell how to use mathematics today, but how it may be used in the future for the betterment of mankind. To neglect the opinion of expert teachers of mathematics in constructing a new course of study is as foolish as to neglect the opinion of experts in any other field.

We need further study and discussion among mathematics teachers as to the best way to cooperate in reorganizing the curriculum in mathematics. The Second Yearbook of the National Council of Teachers of Mathematics is devoted entirely to the consideration of "Curriculum Problems in Teaching Mathematics." *The Mathematics Teacher*, the official journal of the Council will be of great service to all in trying to improve instruction. Local organizations can assist the National Council greatly by helping to get these two important sources of material before the teachers of mathematics in this country.

A Brief Treatment of Analytic Trigonometry

By H. L. SMITH
Louisiana State University

In the present paper is presented a treatment of analytic trigonometry which is brief and general. This treatment was worked out in the fall of 1917 by Dr. G. A. Pfeiffer and the author, while they were associated together as instructors at Princeton University, and has not yet appeared in the literature so far as the author is aware.

1. *The distance formula.* We assume that a system of rectangular coordinates has been set up in a plane; in this system a point P

of the plane will have two coordinates x, y; the symbol P(xy) will denote the point P whose coordinates are x, y. This being understood, the distance between two points P(xy), Q (uv) is given by the formulae

(1) $\sqrt{(x-u)^2+(y-v)^2}$.

We assume this known to the reader; it can easily be proved with the aid of a figure and the Pythagorean proposition of plane geometry.

2. *Functions of the negative of an angle.* If A is any trigonometric angle, the functions of its negative, $-A$, are given by the formulae:

(2) $\sin(-A) = -\sin A$, $\cos(-A) = \cos A$, $\tan(-A) = -\tan A$, $\csc(-A) = -\csc A$, $\sec(-A) = \sec A$, $\cot(-A) = -\cot A$;

these follow at once from the definitions of the functions and by aid of a figure.

3. *The cosine addition theorem.* We now show that if A, B are any two trigonometric angles, then

(3) $\cos(A+B) = \cos A \cos B - \sin A \sin B$.

To this end let C be the circle whose centre is the point O(oo) and whose radius is 1. Place angle A with its vertex at O and its initial line along the x-axis; let P(pq) be the point in which its terminal line cuts C. Next place B with its vertex at O and its initial line along O P; let U (uv) be the point in which the terminal line of B cuts C. Finally place $-B$ with its vertex at O and its initial line along the x-axis; let R(rs) be the point in which its terminal line cuts C.

By the definition of sine and cosine, we now have

(4) $\cos A = p$, $\sin A = q$, $\cos(A+B) = u$, $\sin(A+B = v$; similarly $\cos(-B) = r$, $\sin(-B) = s$, from which it follows by (2) that

(5) $r = \cos B$, $s = -\sin B$.

Also since P, U, R are all at unit distance from O, we have by (1),

(6) $p^2+q^2 = 1$, $u^2+v^2 = 1$, $r^2+s^2 = 1$.

Finally since equal central angles are subtended by equal chords,

(7) $\overline{TU}^2 = \overline{PR}^2$,

where T is the point (1, 0) But by (1), this equation becomes

(8) $(u-1)^2+v^2 = (p-r)^2+(q-s)^2$.

If now (8) is expanded and reduced by means of (6), there results

$u = pr+qs$,

which by (4), (5) gives (3).

It is essential to note that in the above proof, the angles A, B are completely unrestricted as to magnitude and sense.

In (3), replace B by $-B$ and use (2); there results

(9) $\cos(A-B) = \cos A \cos B + \sin A \sin B$.

4. *Functions of the complement of an angle.* Of the two formulae

(10) $\sin(90°-B) = \cos B$, $\cos(90°-B) = \sin B$,

the first is obtained by substituting $A=90°$ in (9); the second then follows from the first by replacing B by $90°-B$.

5. *The sine addition theorem.* We now prove the formula

(11) $\sin(A+B) = \sin A \cos B + \cos A \sin B$.

We have $\sin(A+B) = \cos(90°-A-B)$ (by (10))

$= \cos(90°-A)\cos B + \sin(90°-A)\sin B$ (by (9))

$= \sin A \cos B + \cos A \sin B$ (by (10)),

as was to be proved.

6. *Conclusion.* The remaining formulae of analytic trigonometry follow from the ones already developed precisely as shown in the usual books on trigonometry.

Looking Forward in School and College

Professor Buchanan of Tulane, gives out interesting information concerning the Nashville meeting of M. A. of A., December 26, 27, 28.

Papers of titles named below will be read by the mathematicians whose names appear opposite the titles:

Professor Crathorne, Illinois, "Statistics."

Professor Wm. Betz, Rochester, N. Y. "Reconstruction of Secondary Mathematics."

Professor Lane, Chicago, "Present Tendencies in Projective Geometry."

Professor Harris, Minnesota, "Application of Mathematics to Botany."

Major Jas. P. Cole, of Louisiana Polytechnic Institute, announces three big things of interest in the work of the L. P. I. mathematical department.

(1) An undergraduate and graduate mathematical club has recently been organized to be known as the Thatcher Mathematical Society, having along with other aims (*a*) the encouragement of specialization in mathematics by those who teach it, (*b*) the emphasis of the values of mathematics, cultural and practical, (*c*) an increased stress on the relation of mathematics to the dependent sciences.

(2) Greatly increased interest in the advanced mathematics courses offered has been shown in the past year.

(3) Classes in history of mathematics and college geometry are flourishing. Differential equations and solid analytics to be offered next year.

(4) The L. P. I. mathematics library has had added to it recently over 100 volumes.

From Mrs. Birdie I. Longmire, Secretary-Treasurer of La.-Miss. Council, writing from Bolton High, Alexandria, comes the following:

"*The Mathematics Teacher* is the only magazine of its kind devoted solely to the interests of the secondary teacher and in my opinion is indispensable to the

teacher who would keep alive to the possibilities of secondary mathematics.

My studies at the University of Chicago have dealt with the same kinds of problems and in many cases the same problems that the *Mathematics Teacher* brings to us and helps us to solve.

Could we not put on a campaign for membership in the National Council of Mathematics Teachers at the State Teachers' conventions in Louisiana and Mississippi?"

Professor P. K. Smith, Hattiesburg, Mississippi, proposes the following problem for solution:

Show that the number of terms in the series

$$\sum_{r=1}^{n}(x_1+x_2+\ldots+xk)^r \text{ is given by}$$

$$\begin{matrix}=\\ n(n<k)\\ k(n>k)\end{matrix}$$

the series $$\sum_{r=1}^{} \frac{n(n-1)(n-2)\ \ldots\ (n-r+1)k(k-1)(k-2\ \ldots\ (k-r+1)}{(r!)^2}$$

Correspondence

From President Hume, University P. O., Miss.

Professor P. K. Smith, *Secretary-Treasurer*,
Station B,
Hattiesburg, Miss.

Dear Professor Smith:

I have read your letter of the 18th with a great deal of interest. Of course I have kept up with the progress of the Mississippi and Louisiana Section of the Mathematical Association of America. Considering the difficulties in the way of such a venture I think that you have done wonderfully well. I am enclosing my check for fifteen dollars and I regret that I am not able to make it more.

With best wishes, I am,

Sincerely yours,
ALFRED HUME, *Chancellor*.

From President Walker, A. & M. College, Mississippi

Mr. P. K. Smith, *Secretary-Treasurer*,
Hattiesburg, Mississippi.

My dear Mr. Smith:

I have your letter relative to contribution for the Mathematical Association of America and especially the Louisiana-Mississippi Section. I shall be glad to take this up with our mathematics force and see what contribution can be raised. I think your effort is indeed praiseworthy and necessary to stimulate proper interest in mathematical study. I assure you we shall be glad to do what we can in this matter.

Yours very truly,
B. M. WALKER.